IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of
Akinori Minami et al.
Appln. No.: 10/003,415 Group Art Unit: 1771
Filed: December 6, 2001
For: Powders-affixed nonwoven fabric, process for manufacturing same, and sheet material containing same

DECLARATION UNDER 37 C.F.R. 1.132

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

I, Akinori MINAMI, citizen of Japan, residing at c/o Japan Vilene Company Ltd., 7, Oazakitatone, Sowa-machi, Sashima-gun, Ibaraki 306-0213, do sincerely and solemnly declare:

THAT I am by profession a chemist having earned a Bachelor's degree in polymeric chemistry from Faculty of Engineering, Department of Applied Chemistry, Tottori University in March, 1972;

THAT since April, 1972, I have been an employee of Japan Vilene Company Ltd., and since April, 1973, I have been engaged in research activities relating to research and development in nonwoven fabric;

THAT I am an inventor of the invention of the above-identified U.S. Patent Application (referred to as "the present invention" hereinbelow) and therefore, am completely familiar with the present invention;

THAT I have reviewed and understand the first Office Action of July 2, 2003, and U.S. Patent No. 5,885,696 (referred to as "the Groeger Reference" hereinbelow) and U.S. Patent No. 5,962,112 (referred to as "the Haynes et al. Reference" hereinbelow); and

THAT in order to show the patentability of the present invention over the Groeger Reference, in view of the Haynes et al. Reference, the following experiment was carried out under my direction and supervision.

EXPERIMENT

(1) Preparation of powders-affixed nonwoven fabric (Ia) of the present invention:

Islands-in-sea type fibers (fineness = 1.7 dtex) having 25 island components of high-density polyethylene and polypropylene in a sea component of polylactic acid were prepared by a composite spinning method, and cut to a fiber length of 1 mm. The resulting islands-in-sea type fibers were dipped in a 10 mass% aqueous solution of sodium hydroxide, and the sea component of polylactic acid was extracted and removed by hydrolysis. Then, the product was air-dried to obtain bundled aggregates of the islands-in-sea type fine short fibers (a fiber diameter = 2 μm; a fiber length = 1 mm; adhesion rate of adhered substances = less than 0.02 mass%; sectional shape = circle, and islands-in-sea type) wherein polypropylene components were

scatteringly present in high-density polyethylene. The resulting fine short fibers were drawn but not fibrillated. Each of fine short fibers had substantially the same diameter in an axial direction thereof.

As the powder materials, manganese dioxide powders having an average particle size of 26 μm were used.

Thereafter, a powders-affixed nonwoven fabric of the present invention was produced by an apparatus similar to the manufacturing apparatus as shown in Fig. 1 attached to the specification of the above-identified U.S. Patent Application No. 10/003,415. More particularly, the bundled aggregates of the fine short fibers and the manganese dioxide powders were charged into the mixer at a mass ratio of 10:90, and loosened and mixed. The mixture was supplied to a Venturi tube with a truncated cone shape having a cross-sectional circular shape at an ejecting opening (diameter = 8.5 mm) and a cross-sectional circular shape at a supplying side (diameter = 3 mm), and a laminar compressed air (pressure = 6 kg/cm^2) was introduced from the compressed-gas inlet at an inside position near to the Venturi tube. The mixture was ejected from the Venturi tube to the air at dispersing chamber, and the manganese dioxide powders and the islands-in-sea type fine short fibers were brought into collision with a baffle plate placed in front of the Venturi tube, and dispersed. The distance between the baffle plate and the ejecting opening of the Venturi tube was 15 mm. The gas-passing rate at the ejecting opening of the Venturi tube was 118 m/s.

Subsequently, the dispersed manganese dioxide powders and the islands-in-sea type fine short fibers were collected on a nonwoven fabric substrate (a spun-bonded nonwoven fabric of polyester fibers; a mass per unit area =

30 g/m^2) placed on the support of a net, while the air was sucked at a suction rate of 2 m^3/min by a suction box located under the support.

Then, the spun-bonded nonwoven fabric substrate carrying the powders-containing fiber web thereon was heated to 130 °C and pressed for 15 seconds by a fusion press (pressure = 2 kg/cm^2), to obtain a laminated nonwoven fabric containing the powders-affixed nonwoven fabric layer and the nonwoven fabric substrate. The nonwoven fabric substrate was removed from the laminated nonwoven fabric, to obtain a powders-affixed nonwoven fabric of the present invention.

In the resulting powders-affixed nonwoven fabric, the islands-in-sea type fine short fibers and the manganese dioxide powders were fused by the high-density polyethylene components. A mass per unit area, thickness, and an apparent density thereof are shown in Table 1.

(2) Preparation of powders-affixed nonwoven fabric (IIa) of the present invention:

The above procedure described in Experiment (1) was repeated, except that the mass ratio of the fine short fibers and the manganese dioxide powders was 15:85, to obtain another powders-affixed nonwoven fabric of the present invention.

In the resulting powders-affixed nonwoven fabric, the islands-in-sea type fine short fibers and the manganese dioxide powders were fused by the high-density polyethylene components. A mass per unit area, thickness, and an apparent density thereof are shown in Table 1.

(3) Preparation of powders-affixed nonwoven fabric (IIIa)

of the present invention:

The above procedure described in Experiment (1) was repeated, except that the mass ratio of the fine short fibers and the manganese dioxide powders was 20:80, to obtain still another powders-affixed nonwoven fabric of the present invention.

In the resulting powders-affixed nonwoven fabric, the islands-in-sea type fine short fibers and the manganese dioxide powders were fused by the high-density polyethylene components. A mass per unit area, thickness, and an apparent density thereof are shown in Table 1.

(4) Preparation of powders-mixed nonwoven fabric (Ib) for comparison:

In this experiment, a powders-mixed nonwoven fabric for comparison was prepared by a coform process disclosed in the Haynes et al. Reference.

More particularly, a flow of polypropylene melt-blown fibers (average fiber diameter = 2 μm; melting point = 160°C) was formed in the direction same as that of gravity, by ejecting a polypropylene resin from a nozzle piece heated at 320°C and having orifices (orifice diameter = 0.2 mm; pitch = 0.8 mm) at a rate of 0.06 g/min per an orifice, and blowing air at 330°C into the polypropylene resin. From the direction crossing at a right angle to that of the flow of polypropylene melt-blown fibers, manganese dioxide powders (average diameter = 26 μm) were sprayed into the flow to mix the polypropylene melt-blown fibers and the manganese dioxide powders at a mass ratio of 10:90. The mixture was collected on a conveyor belt to obtain a powders-mixed fiber web.

Then, the powders-mixed fiber web was heated to

130 °C and pressed for 15 seconds by a fusion press (pressure = 2 kg/cm^2), to obtain a powders-mixed nonwoven fabric for comparison.

In the resulting powders-mixed nonwoven fabric, the melt-blown fibers and the manganese dioxide powders were weakly fused. A mass per unit area, thickness, and an apparent density thereof are shown in Table 1.

(5) Preparation of powders-mixed nonwoven fabric (IIb) for comparison:

The above procedure described in Experiment (4) was repeated, except that the mass ratio of the polypropylene melt-blown fibers and the manganese dioxide powders was 15:85, to obtain another powders-mixed nonwoven fabric for comparison.

In the resulting powders-mixed nonwoven fabric, the melt-blown fibers and the manganese dioxide powders were weakly fused. A mass per unit area, thickness, and an apparent density thereof are shown in Table 1.

(6) Preparation of powders-mixed nonwoven fabric (IIIb) for comparison:

The above procedure described in Experiment (4) was repeated, except that the mass ratio of the polypropylene melt-blown fibers and the manganese dioxide powders was 20:80, to obtain still another powders-mixed nonwoven fabric for comparison.

In the resulting powders-mixed nonwoven fabric, the melt-blown fibers and the manganese dioxide powders were weakly fused. A mass per unit area, thickness, and an apparent density thereof are shown in Table 1.

(7) Evaluation

Each sample (10 cm x 20 cm) to be evaluated was fixed to an electromagnetic vibrating feeder (Type: CF-1; manufactured by Shinko-denki), and then an amount of manganese dioxide powders dropped from the sample was measured when vibrated at an amplitude of 1.6 mm for 10 minutes. The results are shown in Table 1, as a percentage of dropped powders, which is calculated by the following equation:

[Percentage of dropped powders (%)] = (W_d/W_o) x 100

wherein W_o means an amount of manganese dioxide powders contained in the sample before vibration, and W_d means an amount of manganese dioxide powders dropped by vibration.

Table 1

Experiment	Fabric	A (g/m^2)	B (mm)	C (g/cm^3)	D	E (%)
1	(Ia)	145	0.10	1.45	10:90	0.3
2	(IIa)	120	0.10	1.20	15:85	<0.1
3	(IIIa)	90	0.85	1.06	20:80	<0.1
4	(Ib)	145	0.21	0.69	10:90	11.5
5	(IIb)	120	0.20	0.60	15:85	7.8
6	(IIIb)	90	0.17	0.53	20:80	5.4

A: a mass per unit area, B: thickness, C: an apparent density, D: a ratio of fibers and MnO_2 powders, and E: a percentage of dropped powders.

RESULTS

As shown in Table 1, the MnO_2 powders rarely dropped from the powders-affixed nonwoven fabrics prepared in Experiments 1 to 3 [i.e., the powders-affixed nonwoven fabrics (Ia)-(IIIa) of the present invention], in comparison with the powders-mixed nonwoven fabrics (Ib)-(IIIb) for comparison prepared in Experiments 4 to 6. It is found that the dropping of particles cannot be avoided in the powders-mixed nonwoven fabrics (Ib)-(IIIb) prepared by the coform process disclosed in the Haynes et al. Reference.

I, the undersigned declarant, declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001, or Title 18, of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Singed this **24th** day of **September** , 2003.

Akinori Minami

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